1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

2ND AND 4TH ORDERS

CA

21

Drilling in caving minerals. M. A. Zavatskii. *Azerbaidzhanskoe Neftyanoe Khoz.* 1936, No. 5, 11-17.—A detailed description of cave-ins in a number of wells is presented. The application of tannins, water glass and barite-contg. mud solns. did not prevent cave-ins.

A. A. Bochtlingk

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZAVARITSKIY, Aleksandr Nikolayevich; SOBOLEV, Vladimir Stepanovich; SMIRNOVA, Z.A., red. izd-va; GUROVA, O.A., tekhn. red.

[Physicochemical fundamentals of the petrography of igneous rocks] Fiziko-khimicheskie osnovy petrografii izverzhennykh gornykh porod. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po geol. i okhrane nedr, 1961. 382 p. (MIRA 14:11)

(Rocks, Igneous)

ZAVARITSKIY, Aleksandr Nikolayevich, akademik; BETEKHTIN, A.G., akad. [deceased], otv. red.; GODOVIKOVA, L.A., red.izd-va; POPOVA, S.T., red.; KASHINA, P.S., tekhn. red.

[Selected works] Izbrannye trudy. Moskva, Izd-vo AN SSSR. Vol.4. 1963. 727 p. (MIRA 16:10)
(Ural Mountains—Copper ores) (Volcanoes)

ZAVARITSKIY, N. V.,

"Heat Resistance of Contacting Metallic Surfaces at Helium Temperature,
Zhurnal Tekhnicheskoi Fiziki, 1951, Vol 21, Nr 4, pp 453-457.

The contact investigated was between two conical copper surfaces in a brass casing. The results were as follows: For small overtemperatures of the specimen above the surrounding He-chamber the heat exchange remains practically constant. The heat exchanged depends on the tight sealing of the mechanical contact between the two cones. At rising pressure p the specific heat exchange per cm^2 surface increases in direct proportion with p. At the instant of making and of breaking contact, the heat due to friction and to deformation is liberated. In the second case it depends on the speed of deformation, i.e. for steady separation it is $3 \times 10^{-}$[illegible] cal, at a sudden separation, $8 \times 10^{-}$[illegible] cal.

ZAVARITSKIY, N.V.

Metallurgical Abst.
Vol. 21 Apr. 1954
Properties of Metals

MT

*Critical Magnetic Field of Supraconducting Films of Tin. N. V. Zavaritsky (*Doklady Akad. Nauk S.S.S.R.*, 1951, 78, (4), 665–668).—[In Russian]. Z. measured the critical magnetic field of supraconducting films of Sn, $4\cdot4 \times 10^{-6}$ to $1\cdot5 \times 10^{-4}$ cm. thick, prepared by vacuum evaporation on to the polished flat base of a glass flask, through which 4 leads were sealed for potentiometric measurement of the film resistance. Both films condensed at room temp., and films condensed on to a surface at 95° K. then annealed before measurement at room temp., were studied, all determinations being made at the min. measuring current (10^{-6} for thin films, 10^{-4} for thick). The temp. range in which the elect. resistance fell from the value in the normal state (R_n) to zero was $\pm 0\cdot01°$. The critical transition temp. T_k (taken as the temp. at which the resistance $= R_n/2$), lay between 3·75° and 3·84° K., but there was no correlation between T_k and the film thickness *d*. The small difference between T_k and the value for massive Sn is evidently due to stresses in the film, set up on cooling from room temp. to liq.-He temp. The critical magnetic field H_k was measured ‖ the plane of the film, with an accuracy of a few minutes. For films with $d < 2\cdot8 \times 10^{-4}$ cm., the transition between the normal and supraconducting states was reversible for all intervals of measurement; with thicker films it was reversible only near T_k, and hysteresis began with some value of ΔT ($= T_k - T$, where $T =$ temp. of measurement) dependent on *d*, the supraconductivity being restored at a value of *H* less than that at which it was destroyed. Analogous hysteresis was observed on varying *T* at const. *H*. Curves of R/R_n versus *H* at various temp. *T* are given for $d = 1\cdot00 \times 10^{-4}$ cm. ($T_k = 3\cdot777°$ K.). Curves for H_k (supraconductivity being destroyed) versus

(MMC L)

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001964010003-7"

N. V. Zavaritsky 2/2

ΔT (log scales) are given for films with d of 0·044-1·05 microns
and for massive Sn; for $d < 3.8 \times 10^{-4}$ cm. a set of lines
parallel over the whole range of ΔT was obtained. With
thicker films, the lines were still || near T_k, but changed slope
at a certain value of ΔT (different for each d), the lines
becoming close to that for massive Sn. This change and the
appearance of hysteresis are directly related; on plotting
values of ΔT for each film versus d (on logarithmic scales) a
straight line is obtained. A straight line was also obtained
on plotting (log scales) d versus H_k at $\Delta T = 0{\cdot}1°$ K. (extra-
polated values for thick films). With $d > 3{\cdot}3 \times 10^{-4}$ cm.
$H_k/H_{km} = 1 + (7 \pm 1 \times 10^{-4})/d$, where H_{km} is the value of
H_k for massive Sn. In thinner films there was a sharp
increase in H_k/H_{km}. The observed phenomena support the
theory of Ginzburg and Landau (*Zhur. Eksper. Teoret.
Fiziki*, 1950, 20, 1064; *M.A.*, 20, 237), that there is a
transition of the first order in thick films and one of the
second kind in thin films. The point at which the H_k versus
ΔT curve changes sharply corresponds to the point of inter-
section of the asymptotes of the laws $H_k/H_{km} = 2\sqrt{6}\delta_0/d$ and
$H_k/H_{km} = 1 + (\delta_0/d)$ for thin and thick films resp., where
δ_0 is the depth of penetration of the magnetic field. This
point occurs when $d = 3{\cdot}9\ \delta_0$. From Z.'s results, δ_0 was
calculated to be $7 \pm 1 \times 10^{-6}$ cm. at $T = 1{\cdot}3°$ K., and
$(6 \pm 0{\cdot}5 \times 10^{-6})/\Delta T^{1/2}$ cm. near to T_k. These values agreed
satisfactorily with that for massive Sn, $\delta_0 = 4{\cdot}6 \times 10^{-6}/\Delta T^{1/2}$
cm.; cf. also Lauermann and Shoenberg (*Proc. Roy. Soc.*,
1949, [A], 198, 560; *M.A.*, 17, 419). The films used by Z.
were not ideal (especially those with $d < 10^{-4}$ cm.).

—G. V. E. T.

ZAVARITSKIY, N. V.

ZAVARITSKIY, N. V. -- "Investigation of the Superconducting Properties of Films." Sub 2 Feb 52, Inst of Physical Problems imeni S. I. Vavilov, Acad Sci USSR. (Dissertation for the Degree of Candidate in Physicomathematical Sciences).

SO: Vechernaya Moskva January-December 1952

USSR/Physics - Superconductivity, Thallium and Indium 1 Aug 52

"Properties of Superconducting Films of Thallium and Indium," N. V. Zavaritskiy, Inst of Phys Problems imeni Vavilov, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 85, No 4, pp 749-752

Studies dependence of field disrupting supercond upon temp for samples of various thicknesses (10^{-6} to 10^{-4} cm), also dependence of thickness upon temp for various fields. Also studies dependence of specific resistance R/R_n (R_n: normal resistance) upon magnetic field for various temps. Acknowledges advice of A. I. Shal'nikov and tech assistance of S. A. Yakovlev in this work. Submitted by Acad L. D. Landau 3 Jun 52.

227T76

ZAVARITSKIY, N. V.

ZAVARITSKIY, N.V.

Journal of the Institute of Metals
Vol. 21 Part 7
Mar. 1954
Properties of Metals

*Supraconductivity of Bismuth. N. V. Zavaritsky (*Doklady Akad. Nauk S.S.S.R.*, 1952, 86, (4), 687-690; *C. Abs.*, 1953, 47, 936).—[In Russian]. Films of Ag, Cu, Mg, and Sb, condensed on glass at 2° K., show an increased elect. resistance; in particular, Sb becomes almost a semi-conductor. In contrast, Bi condensed at 2° K. becomes a supraconductor, although ordinary Bi has no supraconductive properties down to 0·05° K. The supraconductivity of Bi condensed at a low temp. is in agreement with a similar observation of Hilsch (*Proc. Internat. Conf. Low-Temp. Physics*, 1951, 119). From the temp.-dependence of the current destroying the supraconductivity, on Bi films 1×10^{-6} to $1 \cdot 75 \times 10^{-6}$ cm. thick, the critical temp., T_c, must be above 5° K. By gas-thermometer measurements, T_c lies between 5·6° and 6·0° K. At 20° K. the sp. resistivity of the Bi film increases markedly, and its supraconductive properties change sharply. Bi films annealed at 30°–35° K. lose their supraconductivity down to 1·5° K. Whereas with unannealed films, the sp. elect. resistance remains unchanged between 6·5° and 15° K., annealed films show a slight increase in the resistance, of the order of a few %, as the temp. decreases from 15° to 6·5° K. Parts of the film, on heating, become green in transmitted light; the green areas have a higher elect. resistance. Evidently condensation at 2° K. produces a certain modification of Bi which shows supraconductivity up to about 6° K. This modification has a sp. elect. resistance about $\frac{1}{10}$ that of the non-supraconductive modification which is obtained by condensation at higher temp. and which, in contrast, has no absorption in the long-wave part of the visible range. Transition from the first modification to the second is gradual, beginning at about 17° K. and being not entirely completed at 20° K. This gradual transition over a wide temp. range apparently takes place in discrete portions of the film.

ZAVARITSKIY, N.V.

The superconducting properties of films of thallium and tin condensed at low temperatures. N. V. Zavaritskii. *Doklady Akad. Nauk S.S.S.R.* 86, 501-4(1952).—The properties were studied of films of Tl and Sn (thickness from several microns to 2×10^{-6} cm.) that were condensed at 80° and 2°K. The crit. temp. (T_k) of films condensed at low temp. varied significantly from the usual value of T_k. For Sn the usual value of T_k is 3.72°K. For films condensed at 80°K. T_k = 4.05 and at 20°K. T_k = 4.6. The corresponding values for Tl are 2.40, 2.5, and 2.9°K. For films condensed at 2°K. the film thickness had no effect on T_k, but for films condensed at 80°K. T_k increased continuously as the thickness was decreased below 10^{-4} cm. The observed differences are attributed to structural changes in the metal films. J. Rovtar Leach

ZAVARITSKIY, N. V.

USSR/Physics - Superconductivity, Bi 1 Aug 53

"Properties of Superconducting Modification of Bismuth," N. V. Zavaritskiy, Inst of Physical Problems im Vavilov, Acad Sci USSR

DAN SSSR, Vol 91, No 4, pp 787-790

Superconducting coating of Bi was obtained by evaporating Bi on a surface at 2°K. Results of measurements reveal effect of thickness of Bi coat on superconducting properties and show the critical magnetic field to be $1.45 \pm 0.7 \cdot 10^{-2}$, om. degree$^{1/2}$. Indebted to A. I.

272T84

Shalnikov, A. A. Abrikosov and B. D. Yurasov. Presented by Acad L. D. Landau 4 Jun 53.

USSR/Electricity - Conductivity

Card 1/1 : Pub. 86 - 11/46

Authors : Zavaritskii, N. V.

Title : Superconductivity of bismuth under high pressure

Periodical : Priroda, 43/9, 114-115, Sep 1954

Abstract : The effects of temperature (including those in the region of absolute zero) on the conductivity of metals is reviewed with a view to distinguishing between the characteristics of metals possessing moderate conductivity and those possessing superconductivity. It was found that bismuth, which does not attain superconductivity on lowering the temperature even to 0.05° K, attains such conductivity when its temperature is lowered to 7° C if it is subjected, at the same time to 20,000 or more atmospheres of pressure.

Institution : .....

Submitted : .....

ZAVARITSKIY, N. V.

FD-1836

USSR/Physics - Crystallography

Card 1/1 Pub 146-21/25

Author : Abaulina, E. I., and Zavaritskiy, N. V.

Title : Problem of obtaining a metastable modification of thallium

Periodical : Zhur. eksp. i teor. fiz. 28, 250, February 1955

Abstract : In order to clarify the role of the crystalline lattice in the phenomenon of superconductivity it is important to investigate the various crystalline modifications of one and the same substance at low temperatures. There are three metals (thallium, titanium, and zirconium) whose alpha-modification is superconducting, but their beta-modification at low temperatures has not been investigated. The authors attempted to obtain and study at low temperatures the metastable modification of thallium (99.98% pure); tempering was carried out by several methods. They found that one of the usual methods does not obtain thallium in its metastable modification and that thus the problem of the possibility of tempering pure thallium remains open. They thank A. I. Shal'nikov for his interest and N. V. Belov, laboratory assistant in the Institute of Crystallography, Academy of Sciences USSR, for roentgenograms.

Institution: Institute of Physical Problems, Academy of Sciences USSR

Submitted : September 27, 1954

ZAVARITSKIY, N.V.

D-4

USSR / Atomic and Molecular Physics. Heat.

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9030

Author : Zavaritskiy, N.V., Zel'dovich, A.G.

Title : Heat Conduction of Commercial Materials at Low Temperatures

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 2032 - 2036

Abstract : The upper end of a specimen, placed in a vacuum jacket, is joined with a cold connection to a bath of liquid hydrogen or liquid helium. Attached to its lower end is a heater. The temperature level is maintained by a heater, located in the upper portion of the specimen. The temperature distribution is measured by means of graphite thermometers. The specimen is surrounded by a shield, which has the same temperature as the upper end of the specimen. In the range from 2 to 100° K, the authors measured the heat conductivity of copper (annealed and unannealed) cupalloy (unannealed), duraluminum (unannealed), phosphor bronze (unannealed), "mel'khior" (copper-nickel alloy) (annealed and un-

Card : 1/2

USSR / Atomic and Molecular Physics. Heat. D-4

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9030

Abstract : annealed), manganine (unannealed), stainless steel (unannealed), and graphite composition. The average heat conduction of these materials was calculated in the ranges from 4.2 to 20.4, 20.4 to 78, and 4.2 to 78°.

Card : 2/2

ZAVARITSKIY, N.V.

A possibility for using superconductivity. Priroda 45 no.11:127 N '56. (MLRA 9:11)

1. Institut fizicheskikh problem Akademii nauk SSSR, Moskva (Superconductivity)

ZAVARITS'KIY, N.V.[Zavarits'kyi, N.V.]

Superconductivity. Dos. such. fiz. no.5:251-262 '57. (MIRA 16:6)

(Superconductivity)

ZAVARITSKIY, N.V.

56-5-2/46

AUTHOR: Zavaritskiy, N. V.

TITLE: An Investigation of the Thermal Properties of Superconductors I.Tin (Down to 0,15°K) (Issledovaniye teplovykh svoystv sverkhprovodnikov I.Olovo (do o,15°K))

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1957, Vol. 33, Nr 5, pp. 1o85-1o98 (USSR)

ABSTRACT: Based upon the measurement of both the heat- and thermal conductivity of some various tin tests within the thermal range of o,15 to 4°K, it is possible to determine the specific heat of tin up to o,15°K. The low temperatures were obtained by an adiabatic magnetic reversal of two ingots of iron-ammonium-alum. It has been stated that the specific heat beneath o,45°K is determined by the grid and that the heat varies with $\theta_D = 2o2 \pm 3^{o}K$ according to the Debye-law. Beyond o,45o K the specific heat of the electron occurs, a heat which depends upon the temperature according to

$$C_{ES} = A(t)e^{\left(\frac{-\alpha T_K}{T}\right)}$$

Based upon the results of measurement the free energy of the superconducting electrons below 3° K may be represented versus (or, as function of)

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An Investigation of the Thermal Properties of Superconductors 56-5-2/46
I. Tin (Down to 0,15°K)

$$F_{ES} = BT^n e^{\left(\frac{-\alpha T_K}{T}\right)}$$, in which case

$B = 8,7 \cdot 10^{-4}$ Joule/g.Mol.grad

$n = 2,5 \pm 0,5$

$\alpha = 1,35 \pm 0,10$ The heat conductivity of tin beneath 0,3°K with all test pieces was determined by phonons from the heat transfer. Only with one test piece a diffusion effect of phonons on a specular surface was observed.
In case of higher temperatures the heat conductivity of the electrons appears which changes according to

$$K_{ES} = \text{const.}\, e^{\left(\frac{-\beta T_K}{T}\right)},$$

in which case $\beta = 1,45 \pm 0,05$. The exponential dependence of both the heat conductivity and the specific heat seems to indicate that the stimulated states of the electrons in the superconductor are separated from the main energy ties. There are 2 tables, 9 figures, and 26 references, 6 of which are Slavic.

ASSOCIATION: Institute of Physical Problems of AN USSR (Institut fizicheskikh problem Akademii nauk SSSR)

SUBMITTED: April 4, 1957

AVAILABLE: Library of Congress

Card 2/2

ZAVARITSKIY, N.V., kandidat fiziko-matematicheskikh nauk.

Low temperatures. Priroda 46 no.7:3-9 Jl '57. (MLRA 10:8)

1. Institut fizicheskikh problem im. S.I. Vavilova Akademii nauk SSSR (Moskva).

(Low temperature research)

SOV-47-58-5-2/28

AUTHOR: Zavaritskiy, N.V., (Moscow)

TITLE: The Physics of Low Temperatures (Fizika nizkikh temperatur)

PERIODICAL: Fizika v shkole, 1958, Nr 5, pp 8-14 (USSR)

ABSTRACT: The material contained in this article is to be used by the instructor to help answer various questions of students when studying low temperatures approaching the absolute zero. In this connection, the author supplies information on the following subjects: 1) the struggle between the forces of interaction, endeavoring to regulate the chaotic movement of a body's particles, and the thermal motion constantly destroying the orderliness; 2) thermal capacity and thermal conductivity of solids which prove that the peculiarity of behavior of the body's properties at low temperatures can only be understood from the viewpoint of quantum laws. 3) the quantum effects, which are constantly becoming apparent in the field of low temperatures; 4) the isotopes of helium-3 and helium-4; 5) the magnetic properties of paramagnetics; 6) the discovery of the orderliness of magnetic stages in antiferromagnetics; 7) the importance of low temperatures

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The Physics of Low Temperatures SOV-47-58-5-2/28

for nuclear research and the method of penetrating into the field of low temperatures.
There are 4 graphs, 1 table and 3 diagrams.

1. Physics--Study and teaching 2. Low temperature research--USSR

Card 2/2

AUTHOR: Zavaritskiy, N. V. SOV/56-34-5-10/61

TITLE: The Investigation of the Thermal Properties of Superconductors. II (Issledovaniye teplovykh svoystv sverkhprovodnikov. II)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp. 1116-1124 (USSR)

ABSTRACT: According to recent investigations (Ref 1, 4-7) the specific heat of the electrons in a superconductor depends on T_k/T in an exponential way. But it remained unknown to what extent this dependence is a common feature of any superconductor. Moreover it is still unknown whether there is a law of eigenstates for the properties of these superconductors. In order to solve these problems, the author investigates the thermal properties of aluminum and zinc. The investigation of these metals is of interest also from the point of view of the possibility of immediately measuring the specific heat and the thermal conductivity of the electrons. The method of measurement does not differ essentially from the method which was applied to investigate the thermal properties of tin (Ref 1). Thermal conductivity and thermal diffusivity were determined by direct measurements and therefrom the specific heat was calculated.

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The Investigation of the Thermal Properties of Superconductors.II

SOV/56-34-5-10/61

Cylindrical samples with a diameter of ~I,5 mm and a length of 100 mm were applied. The zinc samples consisted of monocrystals, the aluminum samples, however, consisted of large crystals. Several figures illustrate the results of the direct measurements of thermal conductivity and of thermal diffusivity. Other figures illustrate the specific heat of aluminum and zinc. For sufficiently low temperatures the specific heat of the metals may be described by the formula $c_n = \gamma T + 1944(T/\theta)^3$ Joule/g.mol.grad. θ denotes the Debye (Debaye) temperature. The first term of this formula is due to the thermal conductivity of the electrons, the second is due to that of the lattice. In transition to the superconducting state only the specific heat of the electrons is changed essentially, whereas the heat capacity of the lattice practically remains constant. In the transition of the metal into the superconducting state there is a discontinuity (sudden change) of the specific heat. The relative value $\Delta c/c_n(T_k)$ may be calculated from the variation of the thermal diffusivity at the critical temperature. From the results of this paper there result the values $\Delta c/c_n(T_k) = 1,60 \pm 0,15$ for Al and $\Delta c/c_n(T_k) = 1,25 \pm 0,15$ for Zn.

Card 2/3

The Investigation of the Thermal Properties of Superconductors. II

SOV/56-34-5-10/61

For the interval $T<0,7<T_k$ one may write $c_{es} = A \exp(-\alpha T_k/T)$. The numerical values of the coefficients A and α are given. The variations of the dependence of the thermal properties of the superconductors on the relative temperature T/T_k are determined principally by the value of α. The characteristic properties of the temperature dependence of the thermal conductivity and of the specific heat are correlated. The author thanks P. L. Kapitsa, A. I. Shal'nikov, Yu. V. Sharvin, and P. G. Strelkov for their useful suggestions and V. I. Shishkin who helped to carry out the measurements. There are 11 figures, 2 tables, and 22 references, 5 of which are Soviet.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute for Problems on Physics, AS USSR)

SUBMITTED: October 21, 1957 (initially), and January 29, 1958 (after revision)

1. Superconductors--Thermodynamic properties 2. Lead--Thermodynamic properties 3. Zinc--Thermodynamic properties 4. Electrons--Specific heat

Card 3/3

ZAVARITSKIY, N. V.

24(0) SOV/30-59-2-42/60

AUTHOR: Khalatnikov, I. M., Doctor of Physical and Mathematical Sciences

TITLE: Investigations of Low-temperature Physics (Issledovaniya po fizike nizkikh temperatur)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 2, pp 98-100 (USSR)

ABSTRACT: The 5th All-Union Conference on this problem took place in Tbilisi from October 27 to November 1, 1958. It was attended by physicists from Moscow, Khar'kov, Leningrad, Tbilisi, Sverdlovsk, and Kiyev. 4 fields of low-temperature physics were discussed: superliquidity of liquid helium II, supraconductivity, antiferromagnetism, magneto-resistive effect. The following reports and communications were heard: A. A. Abrikosov, L. P. Gor'kov reported on the investigation of the properties of supraconductive alloys. A. A. Abrikosov, L. P. Gor'kov, I. M. Khalatnikov spoke of properties of supraconductors in the high-frequency magnetic field. D. V. Shirkov and Chen' Chun'-syan' and Chzhou Si-chia', two young Chinese scientists working at Moscow University, described investigations for determination of the influence exercised by the Coulomb (Kulon) interaction of charges on supraconductivity. V. V. Tolmachev explained the

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nature of the so-called collective excitations of the Bose type in supraconductors. D. N. Zubarev, Yu. A. Tserkovnikov spoke of the thermodynamics of supraconductors and B. T. Geylikman, V. Z. Kresin of the thermal conduction of supraconductors. Yu. V. Sharvin, V. F. Gantmakher reported on experimental work with supraconductors. N. V. Zavaritskiy spoke of the measurement of the anisotropy of thermal conductivity in the supraconductive state. In a series of reports problems of the superliquidity of helium were discussed, which was discovered in 1938 by P. L. Kapitsa and the theory of which was set up in 1941 by L. D. Landau. E. L. Andronikashvili and his collaborators investigated the properties of rotating helium. V. P. Peshkov spoke of the effect of the formation of the boundary between superliquid and non superliquid helium. Guan Vey-yan', collaborator of the Institut fizicheskikh problem (Institute of Physical Problems) investigated the properties of the so-called jump in temperature of Kapitsa. I. M. Lifshits, V. G. Peschanskiy investigated galvanomagnetic phenomena in strong magnetic fields for metals with open Fermi surfaces. N. Ye. Alekseyevskiy, Yu. P. Gaydukov experimentally investigated the resistance anisotropy of gold monocrystals in the

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magnetic field. I. S. Kan, B. G. Lazarev combine the presence of a temperature minimum with the structural state of the metal. M. Ya. Azbel' reported on the quantum theory of metallic conductivity in the alternating electromagnetic and constant magnetic field. A. S. Borovik-Romanov reported on the weak ferromagnetism in antiferromagnetic samples of $MnCO_3$. N. N. Kreynes, Ye. A. Turov investigated the magnetic anisotropy of the antiferromagnetic monocrystals $CuSO_4$ and $CoSO_4$. A. A. Alikhanov reported on neutronographic investigations of antiferromagnetics. Ya. G. Dorfman? Kondorskiy and collaborators reported on the susceptibility of nickel and nickel-copper alloys at low temperatures. M. I. Kaganov, V. M. Tsukernik reported on kinetic phenomena in ferromagnetics at low temperatures. A. I. Akhiyezer, L. G. Bar'yakhtar, and S. V. Peletminskiy spoke of computations of the relaxation of the magnetic moment in ferromagnetic dielectrics at low temperatures. T. I. Sanadze spoke of observation results of paramagnetic resonance of terbium in the $TbNO_3 \cdot 6H_2O$ nitrate. G. R. Khutsishvili gave a theoretical analysis of the orientation of the nuclear spin in the Overhauser (Overkhauser)

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effect in nonmetals. B. N. Samoylov, V. M. Reynov and collaborators reported on obtaining orientated nuclei. N. V. Bulatova, V. S. Kogan and B. G. Lazarev showed that hydrogen isotopes in solid state have different structures. I. A. Gindin, B. G. Lazarev, Kh. D. Starodubov and V. I. Khotkevich detected polymorphism in a number of metals at low temperatures. E. L. Andronikashvili, V. P. Peshkov and M. P. Malkov reported on the stage of development of foreign scientific research work in the field of low-temperature physics. At the end of the Conference P. L. Kapitsa spoke of his successful development of investigations in the field of low-temperature physics. The participants of the Conference visited the Institut fiziki Akademii nauk Gruzinskoy SSR (Physics Institute of the Academy of Sciences of the Gruzinskaya SSR) and the Physics Faculty of Tbilisi University as well as the building of the new research atomic reactor near Tbilisi.

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24(8) PHASE I BOOK EXPLOITATION SOV/3156

Zavaritskiy, Nikolay Vladimirovich, Candidate of Physical and Mathematical Sciences

Sverkhnizkiye temperatury (Ultra Low Temperatures) Moscow, Izd-vo "Znaniye," 1959. 23 p. (Series: Vsesoyuznoye obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy. Seriya 9, 1959, no. 24) 38,000 copies printed.

Ed.: I.B. Faynboym; Tech. Ed.: Ye.V. Savchenko.

PURPOSE: This booklet is intended for the layman interested in low temperature phenomena.

COVERAGE: This is a popularized discussion of what the temperature phenomenon is and the basic laws governing it. Changes in the state of matter at very low temperatures make it possible to study and determine certain fundamental properties and characteristics of materials which could not be obtained otherwise. The discussion includes an analysis of the laws governing temperature changes, the nature of energy change at low temperatures and the changes which occur in the state of substances and force

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Ultra Low Temperatures SOV/3156

fields at such low temperatures.

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AVAILABLE: Library of Congress

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24.7600,24.7700,16.7500

76962
SOV/56-37-6-2/55

AUTHOR: Zavaritskiy, N. V.

TITLE: Investigation of the Thermal Properties of Superconductors. III. Anisotropy of the Thermal Conductivity of Gallium

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1506-1516 (USSR)

ABSTRACT: The thermal conductivity of gallium in the normal and superconducting states was measured along different crystallographic axes. The anisotropy detected in the temperature dependence of the electron thermal electrical conductivity in the superconducting state was related to the anisotropy in the gap width in the excitation energy spectrum. The samples were prepared by the method of P. L. Kapitsa (cf., Proc. Roy. Soc., 119, 358, 1928) in the form of monocrystals ~50 mm long and 0.7-0.3 mm in diameter. Samples were divided into those having ~0.1% impurity (mainly Si, P, K, Ca, Al, Ti, V) and those with ~ 0.001% impurity.

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The method of measuring thermal conductivity was analogous to that described by the author in his earlier work (cf., Zhur. eksp. i teoret. fiz., 33, 1085, 1957). The critical magnetic field of Ga is shown in the graph below:

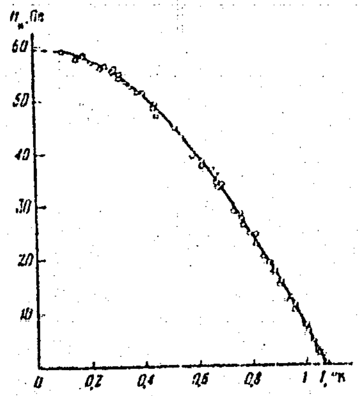

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Fig. 3. Critical magnetic field of gallium.

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The following relations were obtained between the temperature and the critical magnetic field of Ga: T_K 1.08; $(dH_K/dT)_{T = T_K}$ -92; $H_{K,T \to 0^oK}$ 59.5; $(dH_K/dT^o)_{T \to 0^oK}$ 56.5; $10^3 \gamma$ joule/g x mole x deg^2 0.63. In all the samples at temperatures below 2^oK the scattering of electrons by thermal oscillations was insignificantly small in comparison with the scatterings because of the defects in the lattice. The changes in anisotropy with the temperature indicated a sharp difference in the thermal conductivity of Ga along the a and c or b and c directions. The sharpest change in the thermal conductivity anisotropy of electrons was in the region of temperatures lying below the critical temperature. Thus, from T_K to $0.5T_K$ the change in anisotropy between K_a and K_c was only $\sim$ 30%, while from $0.5T_K$ to $0.2T_K$ the change was $\sim$ 200%. There appeared to be a quantitative relation between the anisotropy change of the thermal conductivity of electrons in normal

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Investigation of the Thermal Properties of Superconductors. III. Anisotropy of the Thermal Conductivity of Gallium

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and superconducting states. The degree of anisotropy in Ga was $\sim$30% of Δ_{min}. This work was performed under the guidance of P. L. Kapitsa and A. I. Shal'nikov; V. I. Shishkin participated in the experimental part of this work. There are 6 graphs; 3 tables; and 19 references, 6 Soviet, 8 U.K., 1 French, 1 German, 3 U.S. J. Bardeen, L. N. Cooper, L. R. Schrieffer. Phys. Rev., 108, 1175, 1957; S. J. Laredo, Proc. Roy. Soc., 229, 473, 1955; J. F. Cochran, D. E. Mapother, Phys. Rev., 111, 132, 1958; H. M. Rosenberg. Phil. Mag., 2, 541, 1957; G. M. Graham. Proc. Roy. Soc., 248, 522, 1958 are the most recent U.S. and U.K. references.

ASSOCIATION: Inst. Phys. Problems Acad. Sciences USSR (Institut fizicheskikh problem Akademii nauk SSSR)

SUBMITTED: May 13, 1959

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24(0) SOV/53-67-4-7/7

AUTHOR: Chestsov, R.

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

II. Supraconductivity. 13 lectures were delivered on this field of which two were experimental and the others theoretical. Reports on experimental investigations of supraconductivity were delivered by Yu. V. Sharvin and V. F. Gantmakher (IFP) and N. V. Zavaritskiy (IFP). The former investigated the structure of the intermediate state in monocrystals of pure tin, the latter measured the thermal conductivity of differently shaped orientated cylindrical gallium samples at 0.1 - 4.2°K. A. A. Abrikosov, L. P. Gor'kov and I. M. Khalatnikov (IFP) theoretically investigated the behavior of a superconductor in the high-frequency field. V. L. Ginzburg and G. F. Zharkov (FIAN) dealt with the microscopical theory, and Ginzburg discussed among other things the part played by fluctuations in phase transitions of the second kind. I. M. Lifshits (KhFTI) showed that it follows from the modern theory of supraconductivity in consideration of the anisotropy of metals that, in principle, the existence of supraconductors is possible which are supra-conductive only within a limited range of temperature (and not at all temperatures below the critical ones). B. T. Geylikman and V. Z. Kresin (IAE) investigated the electron- and phonon thermal conductivity of supraconductors by means of the microscopical theory at temperatures that are not very near absolute zero. N. V. Buykov and L. E. Gurevich (FTI AS SSSR) spoke about the surface energy on the boundary between the supraconductive and normal phases. D. N. Zubarev and Yu. A. Tserkovnikov (Matematicheskiy institut AS SSSR - Mathematics Institute AS USSR) dealt with the thermodynamics of the supraconductive state (Froehlich-model). V. V. Tolmachev (MIAN) investigated the problem of collective excitations in a supraconductor. D. V. Shirkov (Ob"yedinennyy institut yadernykh issledovaniy - Joint Institute of Nuclear Research) spoke about consideration of Coulomb-interaction of electrons in semiconductors. The problem of consideration of the Coulomb interaction was discussed by Chen' Ch'un-hsien (?) and Chou, Hsi-hsin (PRC).

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N.D. Zavaritskiy

85363

S/120/60/000/005/037/051
E032/E314

21.5200

AUTHORS: Zavaritskiy, N.V., Sviridov, V.A. and Tolstov, K.D.

TITLE: Sensitivity and Thermal Conductivity of Nuclear Emulsions at Low Temperatures

19

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No. 5, pp. 131 - 132

28

TEXT: НИКФИ-Р (NIKFI-R) and Ilford G-5 nuclear emulsions were investigated. The thermal conductivity of the emulsions was measured by the method described in an earlier paper (Ref. 1). In the temperature interval 4 - 1.5 °K the coefficient of thermal conductivity of the NIKFI-R emulsions can be expressed by the formula:

$$K \sim 2.2 \cdot T^{2.8} \cdot 10^{-5} \text{ W/cm, } {}^{o}K \qquad (1) .$$

A description is given of a low-temperature device which was used to cool the emulsions below 1 °K. The emulsions are cooled by connecting them through a heat-conducting rod to a block of an adiabatically demagnetised material. The sensitivity was measured after irradiating the emulsions with Co^{60} γ-rays

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at 0.1, 0.3, 1.6 and 300 °K. The results obtained are summarised in the following table:

Emulsion	Temperature, °K: 300	1.6	0.3	0.1	Absolute sensitivity at 300 °K (blobs/100μ)
NIKFI-R	100%	(36^{+15}_{-10})%	(31^{+15}_{-10})%	(21^{+15}_{-10})%	~ 60
Ilford G-5	100%	(69±15)%	-	(70±15)%	~ 25

The sensitivity at 300 °K was taken at 100%. Acknowledgments are expressed to P.L. Kapitsa for collaboration in this work.

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Sensitivity and Thermal Conductivity of Nuclear Emulsions at Low Temperatures

There are 2 figures, 1 table and 1 Soviet reference.

ASSOCIATION: Ob'yedinenyy institut yadernykh issledovaniy (Joint Institute for Nuclear Studies)

SUBMITTED: August 13, 1959

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81667
S/056/60/038/06/02/012
B006/B056

24.7600

AUTHOR: Zavaritskiy, N. V.

TITLE: Thermal Conductivity of Superconductors in the Intermediate State

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 6, pp. 1673-1684

TEXT: The author measured the thermal conductivity of lead, tin, and gallium single crystal samples (50 mm long, 1 mm thick) within the temperature range 0.15-3.7°K in the intermediate state (between the normal and the superconducting phase). The characteristics of the samples investigated are given in Tables 1 and 2. The measuring technique was similar to that described in Ref. 4. The impurity concentrations of the samples were $\sim 10^{-3}\%$ (Pb), $2.10^{-3}\%$ (Sn), and $0.2-\sim 5.10^{-4}\%$ (Ga). Figs. 1 and 2 show the thermal resistivity as a function of H/H_{crit}, and Fig. 3 the thermal conductivity in the superconductive state. As shown by Figs. 1 and 2, the transition from the superconductive to the intermediate state

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is accompanied by an increase of the thermal resistivity W of the sample; this increase is independent of the heat flow through the sample. In the transition from the normal to the superconductive state (decrease of H), an inverse effect occurs, however, with the formation of a hysteresis loop. The increase ΔW_{gi} of thermal resistivity in the transition from the superconductive to the normal state is, as explained for the case of heat transfer by phonons, $\Delta W_{gi} \sim T^{-3}$ within the entire temperature range, and is inversely proportional to the structural period of the intermediate state. With a temperature reduction from 1 to 0.15°K, $T^3 \Delta W_{gi}$ changes only by 20 to 30% (Fig. 4). It is shown in the following that by means of the conception of heat transfer by phonons, the totality of the phenomena to be observed in the transition to the intermediate state can, at the utmost, be explained qualitatively. The magnitude of ΔW_{gi} is shown to be a near approach to the theoretical value, if it is assumed that the phonons are scattered from conduction electrons in domains which are in a normal state. In the following, the endeavor is

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made to explain the phenomena by assuming heat transfer by electrons (by the example of the data obtained for gallium crystals). In the case of electronic heat conduction, ΔW_{ei} weakly depends on the impurity concentration of the sample, but the relative change of the thermal resistivity $\Delta W_{ei}/W_{es}$ depends to a considerable extent on the latter. Thus, in the case of a change in concentration from 10^{-2}% to $5 \cdot 10^{-4}$%, $\Delta W_{ei}/W_{es}$ increases from 0.8 to 6 (at $T \sim 0.1^{\circ}$K). The temperature dependence of $\Delta W_{ei}/W_{es}$ is, however, similar for all samples (Fig. 5). Fig. 7 shows ΔW_{ei} and $\Delta W_{ei}/W_{es}$ as functions of T/T_{crit}. The author, contrary to Hulm (Ref. 16), assumes that the increase of the thermal resistivity in the intermediate state is essentially due to a change in the electronic heat transfer in the superconducting region. For the purpose of investigating this more closely, additional experiments were carried out; the electrical resistance in the intermediate state was measured, and it was found to be equal to the product of the resistance in the critical magnetic field by the concentration of the normal phase. 4

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Furthermore, W was measured in a high-purity tin single crystal when H was in the direction of minimum (maximum) thermal conductivity; Fig. 9 shows the two curves obtained. It is finally shown that at temperatures below $0.4T_{crit}$ ΔW_{ei} is close to that calculated on the assumption that the electron mean free path be limited by the domain boundaries. The author finally thanks P. L. Kapitsa, A. I. Shal'nikov, A. A. Abrikosov, and Yu. V. Sharvin for discussions. Ye. M. Lifshits is mentioned. There are 9 figures, 2 tables, and 21 references: 10 Soviet, 5 British, and 6 American.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

SUBMITTED: January 7, 1960

4

86889

9.4300 (3203, 1043, 1143)

24.5300

S/056/60/039/005/003/051
B029/B077

AUTHOR: Zavaritskiy, N. V.

[redacted]

TITLE: Measurement of the Anisotropy in the Thermal Conductivity of Zinc and Cadmium in a Superconducting State

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 5(11), pp. 1193 - 1197

TEXT: Several previous studies (Refs. 1,2) proved the existence of anisotropy in the excitation energy spectrum of superconducting gallium and zinc. The present work deals with such measurements for zinc and cadmium. The thermal conductivity of single crystals of zinc and cadmium grown by the method of P. L. Kapitsa (Ref.3) was measured along the principal crystallographic axes. This method was the same as the one used by N. V. Zavaritskiy (Ref.4), apart from an important improvement of the thermal contact between the specimen and the cooling salt. The thermal conductivity (in w/cm.deg) at $T = T_c$ amounted to:

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Measurement of the Anisotropy in the Thermal Conductivity of Zinc and Cadmium in a Superconducting State

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Zn-1	Zn-2	Zn-7	Zn-4	Zn-5	Cd-1	Cd-2	Cd-3
18	8.3	7.5	4.6	2.1	6.92	28.2	9.1

In order to find the critical temperature T_c of these metals, the temperature dependence of the critical magnetic field strength H_c for zinc and cadmium was determined as earlier. The following table shows the most important quantities which characterize $H_c(T)$ and the thermal capacity of the metal calculated therefrom for standard conditions:

	T_c	$(dH_c/dT)_{T\to T_c}$	$(H_c)_{T\to 0^oK}$	$(d^2H_c/dT^2)_{T\to 0}$	$10^3\gamma$
	All data are expressed in joules/g.mole.deg				
Zn	0.82_5	100	52($\pm$0.5)	90	0.68($\pm$0.03)
Cd	0.53	95	28.5($\pm$0.5)	107	0.63($\pm$0.06)

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Measurement of the Anisotropy in the Thermal Conductivity of Zinc and Cadmium in a Superconducting State

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The temperature dependence of thermal conductivity depends upon the crystallographic axis. The largest difference appears between the hexagonal axis and the directions perpendicular to it. The anisotropy in the temperature dependence of thermal conductivity is very pronounced in the change of the ratio between the values of thermal conductivity along several crystallographic axes. The data from measurements made by V. B. Zernov were incorporated. The anisotropy mentioned above can be connected with the anisotropy of the gap width Δ in a temperature range $T \ll T_c$, which separates the excited state from the superconducting "ground state" of the electrons. The results found in this manner are compared with theoretical considerations of I. M. Khalatnikov (Ref.9). Approximation of Δ with the aid of a spheroid gives $K_{\perp}, \Delta_{min}/K_{\parallel}, \Delta_{min} = 4.1\,\Delta_{min}T/(\Delta^2_{max} - \Delta^2_{min})$. This relation is similar to the experimental relation for the temperature range $T/T_c < 0.3$. Also for superconducting cadmium the temperature dependence of thermal conductivity is a function of the crystallographic axis; and this anisotropy is similar to that corresponding to zinc. The data available at present

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Measurement of the Anisotropy in the Thermal Conductivity of Zinc and Cadmium in a Superconducting State

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do not suffice to find a relation between the anisotropy of Δ and that of the properties of the metal under standard conditions. But the correlation of the anisotropic characteristics between Δ and the singularities of the Fermi surface does not seem to be accidental. The theory of I. M. Lifshits et al. (Ref.12) is mentioned. P. L. Kapitsa and A. I. Shal'nikov are thanked for their interest. A. F. Rusinov is mentioned. There are 3 figures, 1 table, and 12 references: 8 Soviet and 5 US.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

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88429

24.2140 (1072 only)
24.7600 (1143, 1158, 1160)

S/056/60/039/006/016/063
B006/B056

AUTHOR: Zavaritskiy, N. V.

TITLE: Thermal Conductivity of High-purity Thallium and Tin

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 6(12), pp. 1571 - 1577

TEXT: The author investigated the thermal conductivity of high-purity thallium and tin single crystals (having a small ratio T_c/Θ, T_c - temperature of the transition into the superconductive state, Θ - Debye temperature) in the normal and superconductive state, in order to find out how the thermal conductivity changes if one passes from electron scattering by lattice imperfections to electron scattering by thermal vibrations. The investigations on tin were carried out together with L. G. Koreneva, the purification of tin under the supervision of N. N. Mikhaylov in the technological department of the IFP (Institute of Physical Problems). The characteristics of the specimens investigated are given in the Table. The

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Thermal Conductivity of High-purity Thallium and Tin

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part played by the various processes of electron scattering was determined by measuring the thermal conductivity in normal (K_n) and in superconductive (K_s) state, and the resistivity. At low temperatures it holds for the normal state (1): $T/K_n = \rho_o/L + TW_i(T)$, where the first term is due to electron scattering from lattice imperfections (specimen boundary); ρ_o is the residual resistivity, L the Lorentz constant; the second term is due to scattering on lattice vibrations, $TW_i(T) = \alpha T^3$. The data obtained for thallium show that (1) holds only in first approximation. $(T/K_n)_{T \to 0^\circ K}$ coincides with ρ_o/L within the limits of measurement accuracy and has approximately the same value at 4-5°K for all specimens (maximal deviations $\sim 20\%$). At lower temperatures a systematic decrease of $TW_i(T)$ in the case of a decrease of the specimen purity may be observed. The ratio of the fraction of electron scattering from lattice inhomogeneities to scattering

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Thermal Conductivity of High-purity Thallium and Tin

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by thermal vibrations is characterized by the quantity $\varrho_0/L\alpha T^3$ (for $T=T_c$). From the table it may be seen that for the purest specimens the thermal conductivity for T_c is limited by the electron scattering by thermal vibrations. The thermal conductivity K_s of a superconductor is determined not only by the thermal conductivity of its electrons, but also by that of the lattice; in the transition from one temperature range, where electron thermal conductivity plays the leading role, to a range where a thermal conductivity of the lattice predominates, a change in the function $K_s(T)$ is thus observed. This change occurs in the case of thallium at 0.3 - 0.4°K. At still lower temperatures, $K_s = f(T^n)$, n = 3 - 3.5. The change in the thermal conductivity on the transition from the normal to the superconductive state is shown in Fig. 5 by the functions $K_s/K_n = f(T/T_c)$ for specimens of different purity (numerical data: see Table). Herefrom it may be seen that with increasing scattering by thermal vibrations (decrease

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of $\rho_0/L a T_0^3$), K_s/K_n decreases near T_0. K_s/K_n in this case is nearly the same for thallium- and tin specimens with the same $\rho_0/L a T_c^3$. Tl and Sn thus show, like Hg and Pb (Ref. 1), a much quicker decrease of the thermal conductivity of electrons in the transition from the normal to the superconductive state, when the electrons are scattered by the thermal vibrations, compared with scattering by lattice inhomogeneities. The author thanks P. L. Kapitsa and A. I. Shal'nikov for their interest and L. G. Koreneva for measurements; V. Geylikman, V. B. Zernov and Yu. V. Sharvin are mentioned. There are 5 figures, 1 table, and 17 references: 5 Soviet, 9 British, 2 US, and 1 Dutch.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Problems of Physics of the Academy of Sciences USSR)

SUBMITTED: July 11, 1960

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ZAVARITSKIY, N.V.; SHAL'NIKOV, A.I.

Making miniature carbon resistance thermometers for low temperatures. Prib. i tekh. eksp. 6 no.1:189-191 Ja-F '61. (MIRA 14:9)

1. Institut fizicheskikh problem AN SSSR.
(Thermometers)

27206

S/056/61/041/002/028/028
B125/B138

9.4330 (1160, 1143, 1139)

AUTHOR: Zavaritskiy, N. V.

TITLE: Tunnel effect between thin layers of superconductors

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 2, 1961, 657-659

TEXT: This article presents the results of a study of the tunnel effect between Al and Al, In, Sn, Pb at temperatures of up to $\sim 0.1^{\circ}K$ on metallic layers $\sim 10^{-5}$ cm thick. The layers were condensed onto a glass backing in the form of ~ 1 mm wide strips at a temperature of $300^{\circ}K$. The tunnel effect was studied at the junctions of the successively condensed metals. An aluminum-oxide film and, in some cases, a BaF_2 layer was used for insulation. The current - voltage characteristics (J - V) between the above-mentioned metals were recorded in normal state (J_n - V) and in the superconductive state (J_s - V). For the tunnel transition of electrons in the normal state (above critical temperature or at field strengths higher critical), the J_n - V characteristic is linear up to $\sim 10^{-3}$ v. At greater potential differences, deviations from linearity are caused by the passage

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of the electrons through the potential barrier. Fig. 1 illustrates the change in the J - V characteristics of metals on passing over the superconducting state. If, at 0.1°K, the blurring of the f(E/T) Fermi distribution is negligibly small, then, current due to tunnel effect between the superconductors will only appears when a voltage $V \geqslant (\Delta_1 + \Delta_2)/e$ is applied, where Δ_1 and Δ_2 are the gap widths of the superconductors in question. It is thus possible to determine $\Delta_1 + \Delta_2$ from the data in Fig. 1, and then Δ can be calculated for Al, In, Sn, and Pb. For the aluminum specimens, only the ratio $2\Delta/kT_K = 3.37 \pm 0.10$ remained constant, while Δ varied with the critical temperature of the specimen ($1.35°K \leqslant T_K \leqslant 1.45°K$). For the other metals, the authors found (Δ in millielectronvolts): $\Delta_{In} = 0.505 \pm 0.01$; $\Delta_{Sn} = 0.56 \pm 0.01$; $\Delta_{Pb} = 1.33 \pm 0.02$ mev; $2\Delta_{In}/kT_K = 3.45 \pm 0.07$; $2\Delta_{Sn}/kT_K = 3.47 \pm 0.07$; $2\Delta_{Pb}/kT_K = 4.26 \pm 0.08$. For equal probabilities of tunnel-type penetration through the barrier in the normal and superconducting states one obtains

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$\sigma = \frac{1}{V}\int Q_{s1}(E)Q_{s2}(E - V)\left\{f\left(\frac{E - V}{kT}\right) - f\left(\frac{E}{kT}\right)\right\}dE$ (2). The $\sigma(V)$ functions calculated from this formula for the pairs of superconductors studied are illustrated in Fig. 1. Theoretical and experimental values are very close. They only differ in the immediate neighborhood of $\Delta_1 + \Delta_2$. In Al, in the range $T \lesssim T_K$, σ increases both where $eV \sim \Delta_1 + \Delta_2$ and where $eV \sim \Delta_1 - \Delta_2$. The occurrence of current at $\Delta_1 - \Delta_2$ due to the blurred distribution $(f(E/T))$ was thoroughly investigated by J. Nicol, S. Shapiro, P. H. Smith (Phys. Rev. Lett., 5, 461, 1960) and N. V. Zavaritskiy (ZhETF, 33, 1085, 1957). The results obtained by the author for Al - Pb agree with the results of the aforementioned papers. Similar results were found for Al - Sn. The additional σ maximum at $eV = \Delta_1 - \Delta_2$ is most distinctly marked in Al - Al pair. Between $V = 0$ and $eV = 2\Delta$, the σ ratio diminishes several times. The potential difference at which σ of Al - Al increases substantially is temperature dependence, due to the temperature dependence of the width gap Δ. The temperature dependence $\Delta(T)$ shown in

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Fig. 2 agrees fairly well with the existing theory. The present paper shows, that tunnel effect between $\sim 10^{-5}$ cm thick layers of superconductors is satisfactorily explained by the modern theory of superconduction. The ratio $2\Delta/kT_K$ is no universal constant. When studying tunnel effect in thin layers, the authors found no appreciable anisotropy. P. L. Kapitsa and A. I. Shal'nikov are thanked for their interest in the work. There are 2 figures and 6 references: 3 Soviet and 4 non-Soviet. The two references to English-language publications read as follows: J. Giaever. Phys. Rev. Lett., 5, 147, 464, 1960; J. Nicol, S. Shapiro, P. H. Smith. Phys. Rev. Lett., 5, 461, 1960.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

SUBMITTED: June 7, 1961

Card 4/6

ZAVARITSKIY, N.V.

"The tunnel effect on single crystal tin."

Report submitted tp the 8th Intl. Conference on Low Temperature Physics, London, England 16-22 Sep 1962

ZAVARITSKIY, N. V. and TSARIYEV, V. A.

"Experimental test of the spin-wave theory to ferromagnetic metals"

report to be submitted for the 8th Intl. Conf. on Low Temperature Physics (IUPAP) London, England, 16-22 Sep 62.

S/056/62/043/003/062/063
B104/B102

24,7700

AUTHOR: Zavaritskiy, N. V.

TITLE: Tunnel effect in massive tin

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 3(9), 1962, 1123-1125

TEXT: The tunnel effect between two superconductors was studied. The specimen was a single crystal with a thin (< 10^{-5} cm) tin film condensed on it over a separating film of oxide insulation. The resistance of the insulating film at 4.2°K was 0.5-50 ohm/mm^2. The volt-ampere characteristics were measured at temperatures of from 1.36 to 3.60K. It is inferred from the results (Fig. 1) that the density distribution of electrons near the Fermi surface is more complex in massive tin than in thin layers. The steplike dependence of conductivity $\sigma(V)$ on the voltage is explained by the nonuniform expansion of the gaps in the Fermi surface during transition into the superconducting state. There are 2 figures.

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Tunnel effect in massive tin

S/056/62/043/003/062/063
B104/B102

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

SUBMITTED: July 11, 1962

Fig. 1. Reduced conductivity for the tunnel transition between tin film and massive tin. These experimental results refer to the normal of a plane which forms the angle ϑ with the [001] axis.

Legend: (a) $\vartheta = 60°$, (б) $\vartheta = 22°$, (в) I-V-characteristic (dots) and dV/dI.

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43363
S/056/62/043/005/011/058
B102/B104

24.2200

AUTHORS: Zavaritskiy, N. V., Tsarev, V. A.

TITLE: Variation of saturation magnetization of ferromagnetics at helium temperatures

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1638-1643

TEXT: The temperature variation of the spontaneous magnetic moment, dM_s/dT, was measured between 1.4 and 5°K on iron and nickel cylinders, 3 cm long and of 0.18 cm diameter. The impurity content of Ni was $\leq 0.1\%$, that of Fe $\leq 0.03\%$; both samples were annealed in vacuo at 1000°C for 3 - 4 hrs. Since the variations of M_s are very small in this temperature region (0.01%), dM_s/dT was determined from the oscillations of M_s induced by temperature oscillations. The amplitudes of the latter were measured with three thermometers; the frequency was 9.2 cps and the wavelength 16 cm for iron and 3.6 cm for nickel. At 4.2°K the magnetic

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S/056/62/043/005/011/058
Variation of saturation magnetization of ... B102/B104

susceptibility $\chi = QH^{-3}$ for $1 \leqslant H \leqslant 11$ koe and $Q \simeq 10^{8}$ for Ni. From $M = M_s(1 - gH^{-2})$, $g \simeq Q/2M_0 \sim 10^{5}$, $M_0 \simeq 510$ CGSM for Ni, $dM/dT = (dM_s/dT)(1 - g/H^2) - (M_s/H^2)(dg/dT)$ follows. The corresponding curves are shown in Figs 3 and 4. How far Bloch's law is satisfied at these temperatures was examined from the temperature dependence of dM/M_0dT, which, according to Bloch, should read $dM/M_0dT = \frac{3}{2}CT^{1/2}$. For nickel, agreement was found between $3-5^{\circ}$K, but for iron this was the case only at a field of 2 koe. At lower temperatures or stronger fields the law is violated and dM/M_0dT decreases more rapidly than $\sim T^{1/2}$. The results obtained are compared with the spin wave theory, wherefrom $\varepsilon_k = AK^2 + \mu H$ and

$$M_s = M_0\left\{1 - \frac{CT^{3/2}}{\zeta(3/2)}\left[\zeta\left(\frac{3}{2}\right) - 2\Gamma\left(\frac{1}{2}\right)\left(\frac{\mu H}{kT}\right)^{1/2} - \zeta\left(\frac{1}{2}\right)\frac{\mu H}{kT}\cdots\right]\right\}, \qquad (8)$$

$$\left|\frac{dM_s}{M_0dT}\right| = \frac{3}{2}CT^{1/2}\left[1 - \frac{4}{3}\frac{\Gamma(1/2)}{\zeta(3/2)}\left(\frac{\mu H}{kT}\right)^{1/2} - \frac{1}{3}\frac{\zeta(1/2)}{\zeta(3/2)}\frac{\mu H}{kT}\cdots\right] \qquad (8a)$$

Card 2/4

S/056/62/043/005/011/058
Variation of saturation magnetization of..B102/B104

result. K is the wave vector of the spin wave, A is a quantity proportional to the exchange integral and $\zeta(x)$ is Rieman's zeta function; for iron $C = 3.7\cdot10^{-6}$ and $\mu = 1.1\cdot10^{-20}$ erg/G $\approx 1.2\mu_0$, where μ_0 is Bohr's magneton, for nickel $C = 10^{-5}$ and $\mu = 0.22\cdot10^{-20}$ erg/G $\approx 0.25\mu_0$. Hence the temperature dependence of M_s agrees well with the spin wave theory. There are 6 figures and 1 table.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of physical problems of the Academy of Sciences USSR)

SUBMITTED: June 13, 1962

Fig. 3. $dM/dT = f(H)$ for Ni; o at 2^0K and at 4.2^0K.

Fig. 4. $dM/dT = f(H)$ for Fe; o at 2^0K and at 4.2^0K.

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Variation of saturation magnetization of...B102/B104

Fig. 3

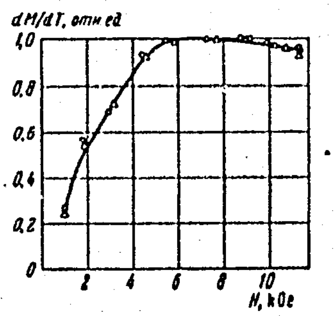
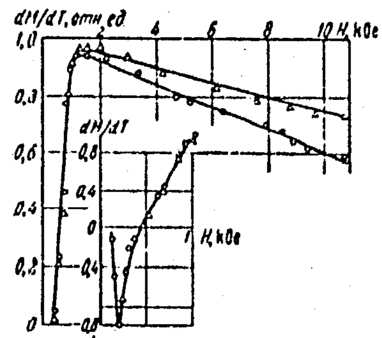


Fig. 4



Card 4/4

ZAVARITSKIY, N.V.

Vacuum-enclosed probe for low temperatures. Prib. i tekh. eksp. 8 no.1:191-192 Ja-F '63. (MIRA 16:5)

1. Institut fizicheskikh problem AN SSSR.
(Low temperature research)

KHARITON, Yu.B.; KONDRAT'YEV, V.N.; BOROVIK-ROMANOV, A.S.; ZAVARITSKIY, N.V.; MALKOV, M.P.; KHAYKIN, M.S.; SHARVIN, Yu.V.

Aleksandr Iosifovich Shal'nikov; on his 60th birthday. Usp. fiz. nauk 87 no.1:171-172 S '65. (MIRA 18:9)

ZAVARITSKIY, N.V.

Quantum energy levels of electron excitations in the intermediary state of a superconductor. Pis'. v red. Zhur.eksper. i teor.fiz. 2 no.4:168-171 Ag '65. (MIRA 18:10)

1. Institut fizicheskikh problem AN SSSR.

L 25487-66 EWT(m) IJP/JG

AUTHOR: Vul, B. M.; Zavaritskaya, E. I.; Zavaritskiy, N. V.

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B

ORG: Physics Institute im. P. N. Lebedev, AN SSSR, Moscow (Fizicheskiy institut AN SSSR); Institute of Physics Problems im. S. I. Vavilov, AN SSSR (Institut fizicheskikh [illegible]

[illegible] at low temperatures

[illegible]

TOPIC TAGS: gallium arsenide, tunnel effect, volt ampere characteristic, tunnel diode, temperature dependence, electron distribution

ABSTRACT: The purpose of the investigation was to determine the features and characteristics of tunnel diodes near zero [illegible]. The measurements were made [illegible] [illegible] [illegible] x [illegible] cm [illegible], at temperatures [illegible]
[illegible]
[illegible] against V, [illegible] were obtained. The I(V) and [illegible] were obtained by a procedure described earlier (ZhETF v. 45, 1639, 196[illegible]), and d^2V/dI^2 was determined by doubling the frequency of the signal. The results have shown that [illegible] near [illegible] maximum [illegible]
[illegible] temperature [illegible]
[illegible]K. The half width of the maximum decreases [illegible] with decreasing temperature. A hypothesis is advanced that the appearance of the maximum is connected with the

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L 25487-66

ACC NR: AP6009680

presence of the singularity in the electron energy distribution function as V approaches zero. It is shown that the results of the experiment may be greatly distorted by the influence of the tunnel junction between the degenerate semiconductor and a superconductor at the location of the ohmic contact. The authors thank P. L. Kapitsa for interest in the work, L. V. Keldysh and Yu. B. Kopayev for valuable discussions, and S. S. Meskin, V. N. Ravich, and M. I. Krendel' for supplying the tunnel diodes. Orig. art. has 9 figures and 2 formulas.

SUB CODE: 20/ SUBM DATE: 07Aug65/ ORIG REF: 002/ OTH REF: 005

Card 2/2

ACCESSION NR: AP4023402 S/0048/64/028/003/0533/0536

AUTHOR: Zavaritskiy, N.V.; Tsarev, V.A.

TITLE: Saturation magnetization of ferromagnetic materials at liquid helium temperatures [Report, Symposium on Ferromagnetism and Ferroelectricity held in Leningrad 30 May to 5 Jun 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.3, 1964, 533-536

TOPIC TAGS: saturation magnetization, low temperature saturation magnetization, iron, nickel, iron saturation magnetization, nickel saturation magnetization, Bloch's law, spin waves

ABSTRACT: The magnetization of nickel single crystals and polycrystalline nickel and iron samples was measured at temperatures from 1.4 to 5°K and magnetizing fields from 1 to 11 kOe. The experimental technique, which gives directly the temperature derivative of the magnetization, is described elsewhere (N.V.Zavaritskiy and V.A.Tsarev, Zhur.eksp.i teor.fiz.16,432,1952). The susceptibility was found to be inversely proportional to the cube of the magnetizing field. Accordingly, the relation between magnetization, M, saturation magnetization, M_s, and magnetizing

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ACCESSION NR: AP4023402

field, H, was of the form $M = M_s(1-q/H^2)$. The temperature derivatives of M_s and q were found to be proportional to each other; i.e., the quantity $M_s dq/q dM_s$ was independent of temperature and was approximately 10 for both metals. The contribution of the para-process to the magnetization of both metals was found to be of the order of 10^{-6}. This is below the upper limit determined by P.Kapitza (Proc.Roy.Soc.A, 131,243,1931). Deviations from Bloch's law $M_s = M_o(1-CT^{3/2})$ were observed at the lowest temperatures and highest fields. The values of dM_s/dT were compared with calculations of M.K.Schafroth (Proc.Phys.Soc.A,67,33,1954), based on simple spin wave theory. This theory was able to account for the deviations from Bloch's law, but in the case of iron it was necessary to assume a value of 1.2 Bohr magneton, instead of the theoretical value 2 Bohr magnetons, for the interaction constant of the spin waves with the magnetizing field. The value of the constant C in Bloch's law was found to be 3.7×10^{-6} for iron, 10×10^{-6} for polycrystalline nickel, and 9×10^{-6} for nickel single crystals magnetized in the [111] direction. These values are in good agreement with results of other workers, obtained at higher temperatures. Orig. art. has: 8 formulas, 5 figures and 1 table.

ASSOCIATION: None

SUBMITTED: 00	DATE ACQ: 10Apr64	ENCL: 00
SUB CODE: PH	NR REF SOV: 003	OTHER: 007

Card 2/2

ACCESSION NR: AP4009104 S/0056/63/045/006/1839/1849

AUTHOR: Zavaritskiy, N. V.

TITLE: Investigation of tin by the tunnel effect

SOURCE: Zhurnal eksper. i teoret. fiziki, v. 45, no. 6, 1963, 1839-1849

TOPIC TAGS: tin, superconducting tin, tunnel effect, spectrum gap, energy gap, Fermi band, Fermi surface, nearly free electron model, temperature variation of gap, superconductivity theory

ABSTRACT: The tunnel effect is used to determine the width of the gap in the electron energy spectrum of superconducting tin. The object of the investigation, unlike earlier experiments, was single-crystal tin of such high purity that the electron free path exceeded by many times the characteristic period dimensions in the superconductor. This disclosed previously unobserved effects connected with the anisotropy of the properties of tin. Preliminary results

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ACCESSION NR: AP4009104

were published earlier (ZhETF, v. 43, 1123, 1962). The gap width $2\Delta/kT_c$ changes from 2.7 to 4.3, depending on the crystallographic orientation. The anisotropy of Δ is a complex phenomenon for there are extensive angular regions ($\sim 15^o$) in which the change in Δ does not exceed 2 per cent, while in narrower regions ($\sim 5^o$) there are changes amounting to 20 per cent. Such an anisotropy is explained by assuming that contributions to the tunnel current are made by electrons from different Fermi bands for different samples, and the deviations are interpreted on the basis of the almost free electron model of the Fermi surface. The relative temperature variation of the gap width is close to that which follows from the theory of superconductivity. The author is grateful to P. L. Kapitsa for interest in the work and for support, and to A. I. Shal'nikov for useful critical remarks and discussions. Orig. art. has: 11 figures.

ASSOCIATION: None

SUBMITTED: 19Jun63 DATE ACQ: 02Feb64 ENCL: 01

SUB CODE: PH NO REF SOV: 010 OTHER: 010

Card 2/2

ZAVARITSKIY, V.A.

Acid volcanic rocks in the Kachar iron ore deposit. Zap. Vses. min. ob-va 89 no.5:513-522 '60. (MIRA 13:10)
(Kachar region--Rocks, Igneous)

ZAVARITSKIY, V. A.

2

Spilite-keratophyre formation in deposits in the vicinity of Bliavi in the Urals. V. A. Zavaritskii. *Trudy Inst. Geol. Nauk* No. 71, *Petrograf. Ser.* No. 24, 1-81(1946).--A detailed petrographical investigation of the volcanic rock of the western slope of the South Urals was made. The report consists of 3 parts: (1) study of the geology of the formations, (2) study of the petrographic properties of the rocks, and (3) study of the problem of the spilites. Tables of chem. analyses of the rocks studied are given. 167 references.

Gladys S. Macy

10/12/54 UN

FA 1T109

ZAVARITSKY, V. A.

USSR/Geology 1947
Mineral Deposits - Pyrites

"On the Metamorphism in the III International (San-Donato) Pyrite Deposit of the Middle Urals," V A Zavaritsky, 12 pp

"Izv Akad Nauk USSR Ser Geol" No 2

A study of the origins of geologic formations in the Middle Urals, based on the unequal foliation of rocks containing the III International pyrite deposit.

1T109

VYSOTSKIY, Georgiy Nikolayevich; ZAVARITSKIY, V.N., kand. geologo-miner. nauk; TYURIN, I.V., akademik, otv. red.[deceased]; RODE, A.A., prof., otv. red.; SPRYGINA, L.I., red. izd-va; PRUSAKOVA, T.A., tekhn. red.

[Selected works]Izbrannye sochineniya. Moskva, Izd-vo Akad. nauk SSSR. Vol.2.[Studies on soils and soil moisture]Pochvennye i pochvenno-gidrologicheskie raboty. 1962. 398 p. (MIRA 16:2)

(Soils) (Soil moisture)

ZAVARKIN, D., tyanul'shchik staleprovolochnogo tsekha; SUBBOTIN, A., stalevar martenovskogo tsekha; TURTANOV, I., starshiy master stana "750".

Our answer to George Meany. Vsem. prof. dvizh. no.4:44-45 Ap '57.
(United States--Labor and laboring classes) (MLRA 10:6)

CA

9

Pumpellyite in the greenstone rocks of the Uchaly region in the Southern Urals. V. A. Zavaritskii. *Bull. acad. sci. U.R.S.S., Ser. geol.* 1944, No. 3, 63-71 (English summary).—Z. points out that this mineral is widespread in greenstones and is seldom found in basic rocks. It develops primarily in rocks rich in CaO and SiO_2, i.e., in dacitic and andesitic porphyrites. I. S. Joffe

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

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8

Greenstone rocks from the region of the Uchala pyrite deposits in the southern Urals. V. A. Zavaritskii.—*Bull. acad. sci. U.R.S.S., Sér. géol.* 1945, No. 2, 37-53 (English summary).—Plagioclase was metamorphosed to albite, and the albite metasomatically replaced by sericite, clinozoisite, prehnite, pumpellyite, or other (unknown) minerals. Pyroxene, where present, is always diopside; replaced by uralite in lower temp. stages, and by chlorites in the still lower stage. Petrographic and mineralogic descriptions of 6 sections are given. Cyrus Feldman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Ca

Some data on the geology of the Uchalinsky pyrite deposit. V. A. Zavaritskii. *Bull. acad. sci. U.R.S.S., Ser. geol.* 1943, 50-70; *Mineralog. Abstracts* 9, 230(1946). —This deposit is intermediate in type between the highly metamorphosed northern Uralian type and the slightly metamorphosed southern type. Spilites, metabasalts, albitophyres, and tuffs occurring in this deposit show, in spite of the metamorphism, relict textures and structures. The data support A. N. Zavaritskii's theory of the genesis of the Uralian pyrite deposits (cf. preceding abstr.).

Michael Fleischer

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Ca

8

Clastic-volcanic rocks in the Bljava pyrite deposits, South Urals. V. A. Zavaritskii. *Bull. acad. sci. U.R.S.S., Sér. géol.* 1943, 47-58; *Mineralog. Abstracts* 9, 238(1946).—Description of the keratophyre-spilite volcanic complex and especially of the pyroclastic deposits which enclose the pyritic ore. The breccias are shown to be of volcanic and not of tectonic origin. Michael Fleischer

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZAVARITSKIY, V.A.

Utilization of converging light in the Fedorov universal stage for investigation of optical properties of crystals. Zap.Vses.min.ob-va 82 no.4:266-270 '53. (MLRA 7:1)

1. Deystvitel'nyy chlen Vsesoyuznogo Mineralogicheskogo obshchestva. (Crystallography)

SHKONDE, E.I., kand. sel'khoz. nauk; RCZOV, N.N.; SOKOLOV, A.V., doktor sel'khoz. nauk, otv. red.; SERDOBOL'SKIY, I.P., red. [deceased]; ZAVARITSKIY, V.N., red.; MUZYCHKIN, Ye.T., red.; FEDOROVSKIY, D.V., red.; BOLOTINA, N.I., red.; ALEKSEYEVA, D.M., red.; ANDREYEVA, Ye.A., red.

[Agrochemical characteristics of the soils of the U.S.S.R.; regions of the Northern Caucasus] Agrokhimicheskaia kharakteristika pochv SSSR; raiony Severnogo Kavkaza. Moskva, Izd-vo "Nauka," 1964. 364 p. (MIRA 17:6)

1. Akademiya nauk SSSR. Pochvennyy institut im. V.V.Dokuchayeva.

ZAVARNAKIN, A.N., inzh.

Effect of nonregulated balancing systems of traction substations on the magnitude of reverse sequence currents. Trudy MIIT no.199:52-64 '65.

Phase loads of the transformers of a.c. traction substations during regeneration. Ibid.:65-69 (MIRA 18:8)

1 Oct 52

USSR/Physics-Superconductivity

ZAVARNITSKIY, N.V.

"Problem of the Superconductivity of Bismuth," N. V. Zavarnitskiy

DAN ~~"Dok Ak Nauk~~ SSSR," Vol 86, No 4, pp 687-689

Tested films of Ag, Cu, Mg, Sb, (and) Bi, deposited on glass at 2°K. First 4 metals showed increasing specific resistance and Sb revealed semiconducting properties, while Bi exhibited superconductivity, in agreement with recent research (See ~~cf~~ Hilsch, Proc. Intern. Conference of Low Temperature Physics, Oxford, 1951). Indebted to A. I. Shal'nikov.

Presented ~~Submitted~~ by Acad L. A. Landau 31 Jul 52.

232T93

ZAVAROV, A., arkhitektor.

Kiev today and tomorrow. Tekh.mol. 22 no.5:3-7 My '54. (MLRA 7:6)
(Kiev--Description)

Rapid determination of carbon dioxide in ammonium salts containing carbon. G. Zavurov. *Zavodskaya Lab.* 8, 1061-3(1939).—The Winkler method for detg. carbonates is modified to make it applicable to solns. contg. NH_4 salts. The NH_4 group is removed with formalin and an excess of NaOH and the soln. is then analyzed by the Winkler method; the carbonate is pptd. with $BaCl_2$ and the excess NaOH is titrated with HCl. The procedure requires only 10-12 min. and is applicable to solns. contg. urea. Corrections should be made for the acidity of the formalin and for the CO_2 in the alkali. H. Z. Kamich

METALLURGICAL LITERATURE CLASSIFICATION

22

CA

PROCESSES AND PROPERTIES INDEX

Rational preparation of soap-base lubricating emulsions. G. Zavarov. *Vestnik. Metalloprom.* 13, No. 10, 70-2 (1933); *Chimie & industrie* 31, 1332.—The tests led to the development of the following technic: Cook 3 parts of vegetable oil and 1-2 parts of mineral oil with NaOH (a little more than 130 g. per kg. of vegetable oil) till foaming ceases and the temp. reaches 180°. Add gradually 13 parts of mineral oil in successive portions at 10-15-min. intervals with continued heating and stirring, bringing the temp. to 190-210°. Pour into wooden tubs and let cool to 70°. Add 9 parts of water with stirring. At a certain point the mass begins to thicken and to clear, and when all the water has been added the mass has a creamy appearance. A. Papineau-Couture

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

10(4) SOV/119-59-9-11/19

AUTHOR: Zavarov, G. A., Engineer

TITLE: A Simple Dosing Device

PERIODICAL: Priborostroyeniye, 1959, Nr 9, pp 22-23 (USSR)

ABSTRACT: The author of the present paper constructed and tested a simple dosing device for the automatic periodic dosing of two liquid components. This dosing device is suitable for the production of periodically operating automatic appliances, used for the colorimetric determination of slight admixtures in liquids. Together with potentiometric determinations of an excess of a reagent, limits of admissable admixtures may also be determined by the above dosing device, as part of an automatic signalling apparatus. The construction of such a device is shown in a figure. The main component passes through an apparatus with continuous flow into the device described above, and from there drops continuously into the funnel of the graduated pipette. The pipette gradually fills up to a certain height. When this is reached a siphon is put into action and the measured amount pours into the mixer. The operating mode of the different parts of the device are described. The specific weights of the

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A Simple Dosing Device SOV/119-59-9-11/19

components which are to be dosed must be taken into account in the production of this device. The frequency of the dosing process is hardly noticeable in the performance of the graduated pipette. The dosing device described here is used for adding small amounts of a reagent to comparatively large amounts of the main component. After slight adaptations the dosing device may also be used for solving other problems. In the apparatus tested by the author waste sulfuric acid was used as test liquid (main component). The author added an exactly measured amount of a reagent (additional component) to 50 ml acid. After mixing the mixture was passed into a photoelectrolytic cell. Operation of the device may be described as follows: If the maximum content of the admixture to the acid is 0.03%, the signalling device, connected with the dosing device adjusted to this content, gives a signal as soon as the above standard (0.03%) has been exceeded by 0.001 to 0.002%. Finally some hints for the successful production of this device are given. There are 2 figures.

Card 2/2

C-1

3C

1870. Rapid determination of bound carbon dioxide in solutions of ammonium carbonates. O. V. [illegible] (Zavod. Lab., 1939, 8, 1061—1063).—The usual methods of determining CO_2 in aq. solutions of NH_3 and CO_2 cannot be used in presence of urea as they involve heating, which decomposes urea. Heating is avoided if NH_3 is eliminated by adding formaldehyde to form hexamethylenetetramine, and CO_2, HCO_3', and CO_3'' bound by NaOH. The excess of NaOH is titrated with HCl after CO_3'' has been pptd. by $BaCl_2$. A sample of solution containing ~0·4 g. of total CO_2 is mixed with 100 ml. of a solution containing $BaCl_2,2H_2O$ 6% and NaCl 20%, 40 ml. of 0·5n-NaOH and 5 ml. of 40% formaldehyde are added, and

30 c.c. of resin hold 180 mg. of Ca, 100 mg. of Fe or Al, and 60 mg. of Cr, and can be regenerated with 2n-HCl. S. A. M.

1880. Automatic detection and control of hydrogen sulphide. J. Clough (J.S.C.I., 1944, 63, 210—213).—An apparatus designed to detect the emission of H_2S produced in certain chemical processes, and automatically to bring into operation the gas absorption plant, is described. The main features of the apparatus are (1) indication of the liberation of H_2S by means of a light cell and chemically prepared [illegible] and (2) [illegible] amplification apparatus to

METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

C-1

1160. Rapid determination of [illegible] in solutions of ammonium carbonate. G. V. [illegible] (Zavod. Lab., 1959, 2[illegible], 1061–[illegible]).—In an aq. solution containing NH_3 and NH_4 carbonate the $[CO_3^{2-}]$ can be determined by adding NaOH and formaldehyde; NH_3 and NH_4^+ are thus transformed into hexamethylenetetramine, and the solution contains NaOH and Na_2CO_3, which can be titrated by Winkler's method (CO_3^{2-} pptd. with $BaCl_2$ and the excess of NaOH titrated with HCl). I. J. B.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BORISOV, Yu.S., kand. tekhn. nauk; KORNEV, V.K., inzh.; PUSHKASH, I.I., inzh.; YANTSEN, B.D., inzh.; PAREN'KOV, A.Ye.; ZAVARNITSYN, D.A.

Using liquid fuel in bl-st furnaces of the Nizhniy Tagil metallurgical combine. Stal' 25 no.6:497-503 Je '65. (MIRA 18:6)

1. Nizhne-Tagil'skiy metallurgicheskiy kombinat i Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov.

ZAVAROV, G.V.

Determination of thionyl chloride in mixtures of sulfur chlorides and sulfuryl chlorides. Zav.lab. 30 no.4:409-412 '64. (MIRA 17:4)

1. Chernorechonskiy khimicheskiy zavod imeni M.I.Kalinina.

ZAVAROV, G.V.

Determination of pyrosulfuryl chloride in commerical chlorosulfonic acid. (MIRA 14:10)
Zav.lab., 27 no.10:1208-1211 '61.

1. Chernorechenskiy khimicheskiy zavod im. M. I. Kalinina.
(Pyrosulfuryl chloride)
(Chlorosulfonic acid)

ZUBOV, V.Ya.; BASKAKOV, A.P.; GRACHEV, S.V.; ZAVAROV, A.S.; MALIKOV, G.K.

Characteristics of wire patenting in a fluidized bed. Izv. vys. ucheb. zav.; chern. met. 8 no.10:116-119 '65. (MIRA 18:9)

1. Ural'skiy politekhnicheskiy institut.

ZUBOV, V.Ya.; BASKAKOV, A.P.; GRACHEV, S.V.; MALIKOV, G.K.; ZAVAROV, A.S.

Patenting in a fluidized bed with pilot plant equipment. Stal' 25 no.7:664-665 Jl '65. (MIRA 18:7)

1. Ural'skiy politekhnicheskiy institut.

L 41622-66 EWT(m)/EWP(k)/EWP(w)/T/EWP(t)/ETI IJP(c) JD
ACC NR: AP6013359 (A) SOURCE CODE: UR/0370/66/000/002/0076/0084

AUTHOR: Zubov, V. Ya. (Sverdlovsk); Baskakov, A. P. (Sverdlovsk); Grachev, S. V. (Sverdlovsk); Zavarov, A. S. (Sverdlovsk); Antifeyev, V. A. (Sverdlovsk)

ORG: none

33 34 B

TITLE: Patenting of wire in a fluidized bed

SOURCE: AN SSSR. Izvestiya. Metally, no. 2, 1966, 76-84

TOPIC TAGS: ~~fluidized bed,~~ patenting, wire, ~~high~~ carbon steel, metal heat treatment

ABSTRACT: The possibility of constructing an integrated unit for patenting wire in which the heating and cooling of the wire are carried out in a fluidized bed of fine-grained material was studied on specimens of U7A, U8A, U9A, and EI-142 steels. The use of a fluidized bed made it possible to increase the rate of the patenting process by a factor of up to 6, or at the same rate to correspondingly reduce the length of the heating systems as compared to the existing fuel-oil and electric furnaces. By burning gas in a fluidized bed where oxygen is deficient, a nonoxidizing atmosphere can be created, so that the decarburization and scaling on the wire surface are eliminated; in addition, the patenting can be performed at high temperatures under these conditions, and thus the strength characteristics of the patented wire and hence the mechanical properties of the drawn wire can be markedly improved. High-temperature heating during patenting increases the stability of austenite, and hence, leads to a

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greater supercooling for the same temperature of the cooling medium as compared to the usual heating to 920°. This makes it possible to patent wire with large cross sections (8-10 mm) in a fluidized bed. Patenting of high-carbon steel (U12A) in this manner produced drawn wire with a much greater tensile strength than that obtained in conventionally patented steels (U7A, U8A, U9A). Orig. art. has: 5 figures and 7 tables.

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Determination of potassium oxide in synthetic ammonia catalysts. O. V. Zaverov. *Zavodskaya Lab.* 3, 995-7(1934).—The proposed method of analysis gives a highly porous mass of Fe_3O_4 from which the K salt can be rapidly and completely extd. by lixiviation. Large samples (up to 4 g.) of Fe_3O_4 can be used. Evap. 2 g. of powd. sample and about 2 g. of NaCl with 12-15 cc. of concd. HCl to a sirupy mass, add 20-5 cc. of concd. HNO_3, evap. to dryness, ignite on a hot plate until the evolution of N oxides ceases, add 100 cc. of hot H_2O, boil 20-30 min., filter and wash with hot H_2O to a total vol. of 180-90 cc. To clarify the filtrate and to free it from any Fe, Ca and Mg, add a few drops of $FeCl_3$ soln. and a small excess of NaOAc, boil, cool, dil. to 200 cc., filter off 100 cc., add methyl orange, a few drops of dil. HCl and 10 cc. of 20% NaOAc, evap. to 10-15 cc., add the pptg. soln. (100 g. $Na_3Co(NO_2)_6$ and 50 g. NaOAc in 250 cc. H_2O) and 3 drops of 80% AcOH, digest on a water bath at 50° for 20 min., add 5 cc. of satd. NaCl soln., filter through a filter dried at 100-10° and weighed, wash thoroughly with cold H_2O, dry at 100-10° and weigh $K_2NaCo(NO_2)_6.H_2O$. The results with a prepd. mixt. of Fe_3O_4 and K_2O are accurate to 0.01% K_2O. C. B.

METALLURGICAL LITERATURE CLASSIFICATION

Use of Schiff's reagent in the determination of acetaldehyde in acetic acid. G. V. Zavarov. *Zavodskaya Lab.* 4, 1077 (1935).—To prep. Schiff reagent, mix 150 cc. of 0.1% fuchsin with 100 cc. $NaHSO_3$ soln. (d. 1.308), 1000 cc. H_2O and 15 cc. H_2SO_4, and allow to stand for 24 hrs. Prep. standard solns. of 0.02% and 0.1% AcH in 50% alc. Prep. AcOH free from AcH by refluxing 500 cc. of glacial AcOH with 10 g. of CrO_3 for 1 hr. and distg. the acid. Repeat the operation until the AcOH gives no color reaction with Schiff's reagent as described below. Place in a dry test tube 4 cc. of 50% alc., 0.5 cc. of AcOH to be tested and 1 cc. of Schiff's reagent. Place in another tube 3.5 cc. of 50% alc., 0.5 cc. of one of the standard solns. of AcH and 0.5 cc. of the prepd. AcOH. Shake well the 2 tubes and allow the contents to "age" for 30 min. Introduce into each tube 5 or 10 cc. of H_2O, depending on whether 0.02% or 0.1% of the standard AcH soln. was used, and compare in the Dubosc colorimeter. The method is accurate to 0.003% for 0.1% AcH in 95.5% AcOH.

Chas. Blanc

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

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Determination of moisture in liquid sulfur dioxide. G. V. Zavarov. *Zavodskaya Lab.* 5, 1314-18(1936).—Two procedures for the detn. of H_2O in liquid SO_2 are described in detail. One is based on the Fischer method (*C. A.* 29, 6532[9]), depending on the reaction: $SO_2 + I_2 + 2H_2O = H_2SO_4 + 2HI$, and another on combining it with the Kustis method (*C. A.* 27, 2226). The requisite app. is illustrated. **Conductometric method for determining traces of moisture in liquid sulfur dioxide.** V. A. Pleskov. *Ibid.* 1319-22.—The conductometric detn. of traces of H_2O in liquid SO_2 in the presence of dry HCl at −30° (cf. Hagster and Cooling, *C. A.* 14, 2578) is based on the previous method (*C. A.* 27, 218). Chas. Blanc

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